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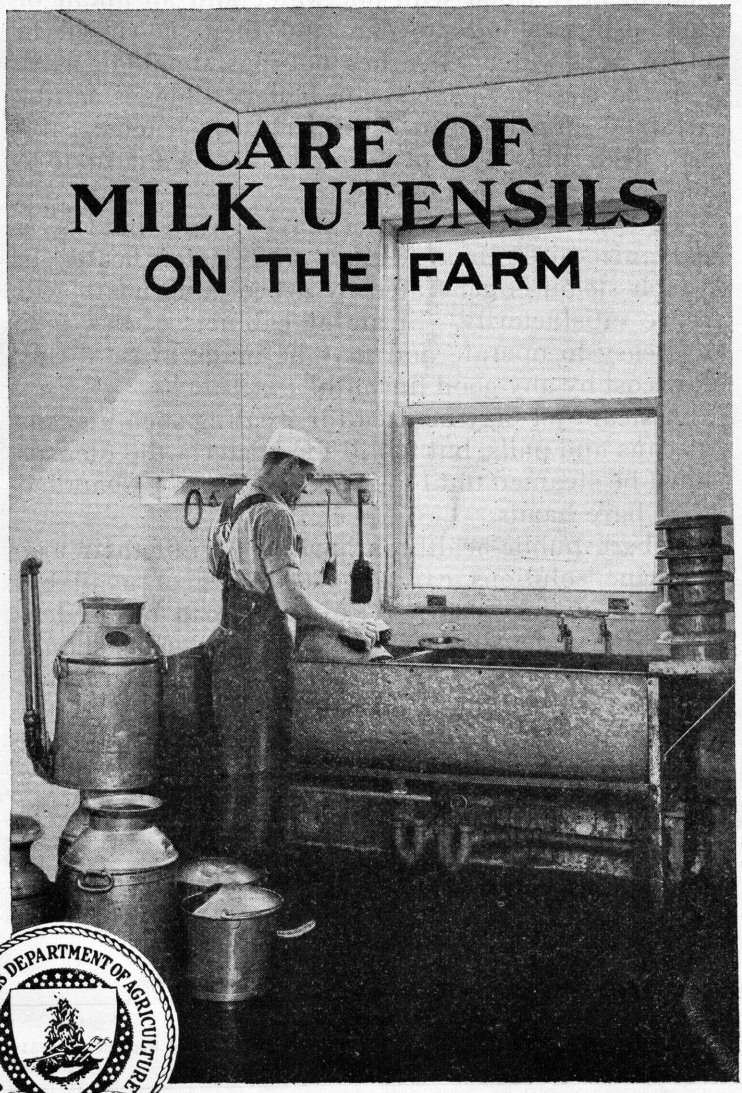
CARE OF MILK UTENSILS ON THE FARM



ALL UTENSILS with which milk comes in contact should be carefully washed and then treated to kill bacteria before being used.

All utensils, before being treated to kill bacteria, should be washed with hot water and an alkali or soda-ash washing powder, and then be rinsed in clean, pure water. Brushes, not rags, should be used.

In dairies that have steam boilers, utensils can be steamed effectively in a properly constructed cabinet, preferably with perforated coils on the floor to distribute the steam evenly.

For dairies that do not have steam boilers, a galvanized-iron box steamer and water heater in which steam is generated by a fire underneath will serve satisfactorily. Steaming cabinets of this type are easy to operate and may be made at relatively low cost by any good tinsmith.

A steam jet may be used for treating such utensils as cans and pails, but to kill the bacteria the utensils must be steamed until they are too hot to be handled with bare hands.

Where public-health authorities permit their use, chlorine solutions carrying 200 parts of available chlorine to 1,000,000 parts of water can be used to treat dairy utensils to kill bacteria. Utensils should be thoroughly drained so that none of the chlorine solution will get into the milk.

Blue prints of different types of steam cabinets may be obtained free from the Bureau of Dairy Industry, United States Department of Agriculture, Washington, D. C.

This bulletin is a revision of, and supersedes, Farmers' Bulletin 1473, Washing and Sterilizing Farm Milk Utensils.

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CARE OF MILK UTENSILS ON THE FARM

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CONTENTS

FAILURE TO CLEAN MILK UTENSILS thoroughly and properly treat [2] them to kill bacteria is one of the main reasons why milk and cream sour. The matter of the cleanliness of the utensils can not be overemphasized, as the retail fluid-milk market requires high-quality milk and cream. The manufacturers of high-grade dairy products of all kinds also insist on quality in the milk and cream. High-quality dairy products can not be made from low-quality milk and cream.

The tiny bacteria that cause souring, off flavors, and sometimes sickness, grow and multiply very fast on the moist surfaces of untreated or improperly treated pails, cans, strainers, etc. Although the utensils may appear to have been washed well, they are not really clean unless most of the bacteria have been killed. Even in grandmother's day the clean dairy, with its spotless, shining utensils, which had been thoroughly scalded, was noted for its good butter. And to-day the dairies with clean utensils, thoroughly treated to kill bacteria, usually lead in the production of high-quality milk and cream which are low in bacteria.

The quantity and kind of equipment required for washing and treating dairy utensils depend upon the size of the dairy. Small dairies usually need only simple equipment, but in the larger dairies the use of more elaborate equipment is generally more economical.

THE WATER SUPPLY

For washing and rinsing utensils, a clean, safe water supply is absolutely necessary. Contaminated water may be a source of danger

[1] Mr. Posson resigned from the Bureau of Dairy Industry on Jan. 23, 1928.

[2] The expression "treat to kill bacteria" is used instead of "sterilize," because sterilize means to kill all the bacteria, whereas the process commonly used with dairy utensils kills a large proportion of the bacteria but not necessarily all of them.

to health, not only to those on the farm but to all those who use milk from the farm. Wells and springs should always be protected from surface drainage. The drainage from privies, hogpens, barnyards, and other sources of contamination should always be away from the well, and both springs and wells should be walled in, curbed, and kept tightly covered.

HOW TO WASH UTENSILS

Milk utensils should always be throughly washed and rinsed before being placed in the steaming cabinet or treated with chemical solution. Improperly washed utensils are not only more difficult to treat to kill bacteria, but any milk which may be adhering to the utensils may form a deposit. This residue furnishes food for any bacteria which may remain alive after steaming or chemical treatment, enabling them to multiply and contaminate the fresh milk, and makes the utensils harder to clean the next time that they are washed.

The same principles apply to washing utensils in dairies of all sizes. Always remove with cold or lukewarm water as much as possible of the foreign material, milk, and cream adhering to the surfaces of the cans, pails, bottles, and other utensils. Otherwise the wash water soon becomes dirty, highly contaminated with bacteria, and unfit for use. By first rinsing the utensils, washing is made easier and more effective, and less washing powder is required to clean them. After the utensils have been rinsed, remove all remaining foreign matter by scrubbing with a brush, hot water, and an alkali or soda-ash washing powder.

The wash water should be about as hot as the hands will bear. The amount of washing powder required will vary with the hardness of the water and the kind of powder. Enough should be used to "break" the water, so that grease may be removed from utensils. Soap or greasy powder should not be used for washing milk utensils. Before the washed utensils are treated to kill bacteria they should again be rinsed in clean, pure water, either hot or at least slightly warm.

The illustration on the cover page shows the washing room of a farm milk house.

EQUIPMENT FOR WASHING UTENSILS

In all farm dairies where washing is done by hand, the equipment required for washing utensils is the same in type and simple in construction. In dairies where there are few utensils to wash, smaller wash sinks of lighter construction than in the large dairies may be used, and less expensive equipment for heating water will be required, but in general the needs are much the same.

A galvanized-iron round-bottom sink or vat is a decided help in washing utensils. Such a sink may be bought from dairy supply houses. It should have two compartments—one for washing and one for rinsing. By connecting it with a drain and piping water to it, labor is saved and the work of washing is made much easier. (Fig. 1.)

Brushes of various shapes and sizes for different purposes save time and enable one to thoroughly clean the utensils. Rags should not be used, because they are difficult to free of bacteria and have a

tendency to smear grease and other foreign matter instead of loosening it as a brush does.

A separate room, preferably adjoining the one in which the milk is handled, should be provided for washing the utensils. If there are only two rooms in the milk house it is preferable to wash the utensils in the room in which the boiler or stove is situated rather than in the room where the milk is handled. The floor of the wash room should be water-tight and should slope toward a drain.

STEAMING UTENSILS

The utensils may be effectively treated to kill bacteria by placing them in a tight cabinet and turning steam from the boiler into the cabinet for a long enough time to accomplish the result desired.

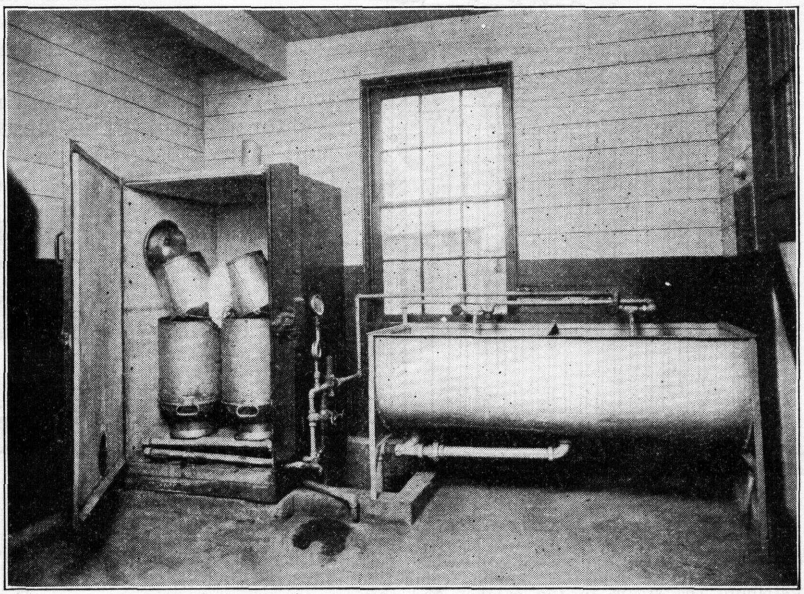

FIGURE 1.—A wooden steaming cabinet, lined with galvanized sheet iron; and a galvanized-iron wash sink, with washing and rinsing compartments

If the boiler is of sufficient capacity, the inside temperature of the cabinet and the utensils may be raised in a few minutes to about that of boiling water. If the steam is evenly distributed in the cabinet, and a reliable thermometer in the top of the cabinet shows that a temperature of 200° F. or higher has been maintained for five minutes or longer, it is certain that the number of bacteria on the utensils will be greatly reduced; a period of time slightly longer than five minutes gives a margin of safety.

Utensils such as cans, pails, and bottles should always be placed in the cabinet in an inverted position. If they are placed open end up it will take longer to heat the utensils, and the condensed steam can not drain from them. Large steaming cabinets may be equipped with slatted shelves or racks, preferably constructed of galvanized angle iron or piping, upon which the utensils may be placed. This

saves space and aids the circulation of the steam. Bottles may be treated in their cases, but, if it is desirable to save space, they may be satisfactorily handled on removable shelves or racks having holes in them to receive the necks.

As steam has a tendency to rise, it should be liberated underneath the utensils, and, if possible, at the bottom of the cabinet. Also it should enter the cabinet from several openings, in order that it will be evenly distributed. One way which has proved satisfactory is to admit the steam through a perforated pipe coil laid on the floor of the cabinet. Another way is to construct shelves of piping connected with the boiler, the center pipe in each shelf being perforated about every foot. The utensils are inverted on these shelves. Coils similar to the ones shown in Figure 2 may be placed on the floor of the cabinet. It will be noted in this instance that the steam passes through a long closed coil before it reaches the perforated coil. This closed coil may be used as a radiator to furnish heat for drying the utensils by closing the valve that admits steam to the perforated coil.

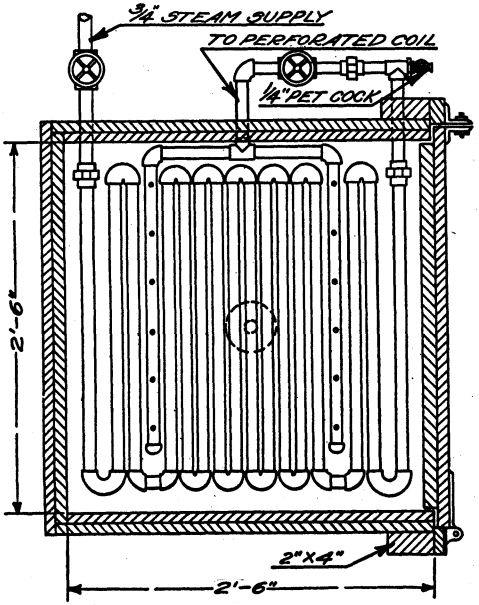

FIGURE 2.—Perforated and closed coils which may be used on the floor of the steaming cabinet to distribute the steam in the cabinet and then dry the utensils after they have been steamed.

CONSTRUCTION OF STEAMING CABINETS

Steaming cabinets may be made of various materials. Wood, galvanized iron, reinforced concrete, hollow tile, brick, or stone, or any material which is not easily damaged by steam and of which a tight box can be constructed, may be used. In the case of wood it is better to use two thicknesses of boards, put on at different angles to prevent warping. A wooden cabinet of one thickness of boards, with a water-tight lining of galvanized iron, makes a satisfactory cabinet. The door should fit tightly so as to prevent the escape of steam.

Wooden cabinets constructed of two thicknesses of 1-inch lumber and galvanized-iron cabinets are practically equal in efficiency. They are about two and one-half times as efficient in the use of steam as uninsulated concrete cabinets. At least twice as much time, and more than twice as much steam, are required to heat an uninsulated concrete cabinet as are required for either of the other cabinets. A steam boiler which is taxed to capacity in operating a concrete cabinet with uninsulated walls 4 or 5 inches thick will furnish enough steam for a wooden or galvanized-iron cabinet more than twice as large: therefore, a boiler of only half as much capacity will be needed

to operate a wooden or galvanized-iron cabinet as would be required for a cabinet made of uninsulated concrete.

It is advisable to equip the cabinet with a safety valve set to open at a low pressure. The ordinary cabinet will withstand very little steam pressure. Increase in pressure gives somewhat higher temperature, but the advantage of the higher temperature from using steam at high gauge pressures is more than offset by the leakage of steam. Utensils can be made practically free from bacteria by steaming with low pressure.

There should be a drain in the floor of the cabinet to carry off condensed moisture. The drain should be water sealed, which may be done by installing a U trap in the drainpipe. The lower part of the trap will remain full of water, which prevents the escape of steam through the drain. If drying coils are to be used after the utensils are steamed, there should be a damper near the bottom of the cabinet and one in the top. The upper damper should open into a galvanized pipe which is extended to carry the vapor outside the building. The cabinet should have a small hole in which to place a thermometer. The most protected place for this is usually in the top of the cabinet or the upper part of the door.

OPERATION OF STEAMING CABINETS

The operation of a steaming cabinet is a simple matter. The time required to reach a sufficiently high temperature in the cabinet for killing most of the bacteria depends upon several factors, including the size and construction of the cabinet, the capacity of the boiler, the pressure of steam developed, the number and size of utensils, and the temperature of the surrounding air. After the temperature of the cabinet has been 200° F. or above for five minutes, the valve leading to the perforated coil may be closed. It may be found in practice that the temperature inside the cabinet will remain high for several minutes after the steam is turned off.

If glass bottles are being treated, steam should be turned in slowly at first, to prevent breakage. For the same reason the cabinet should not be opened or the bottles moved until the temperature has fallen.

Unless utensils are dried in the cabinet or are to be used within a few hours, they should be removed from the cabinet as soon as they are cool enough to handle and inverted on a rack to drain and dry, in a clean place protected from all contamination. Drying after steaming prolongs the life of the utensils, by preventing rust, and it also retards later bacterial growth. It is important to dry utensils thoroughly soon after steaming if they are not to be used within 24 hours.

Drying coils in the cabinet will be found to be a distinct advantage in drying the utensils. When drying coils are in use, the dampers in the bottom of the door and in the top of the cabinet should be opened to permit escape of the moisture evaporated from the utensils after they have been steamed. To dry the utensils, the valve leading to the perforated coil should be shut, and the valve between the closed coil and the boiler left open. The petcock on the closed coil (fig. 2) should be opened slightly so as to let the water from the condensed steam escape. When the cabinet is hot enough to dry the utensils, the steam-supply valve should be closed and the petcock

opened wide. A thermostatic trap may be installed in place of the petcock; this will automatically allow the water from the condensed steam to escape.

THE GALVANIZED-IRON BOX STEAMER

In small dairies where the milk is bottled, and in some wholesale dairies which do not have steam boilers, utensils may be treated to kill bacteria efficiently and economically in a galvanized-iron box. This box is simple in construction, easy and economical to operate, and may be made by almost any tinsmith at small cost. The box is equipped with a tightly fitting lid, and may be set on a concrete, brick, or stone foundation which serves as a fire box, or on a gas or oil stove, or some other heating device. One-half to three-quarters of an inch of water is used in the box.

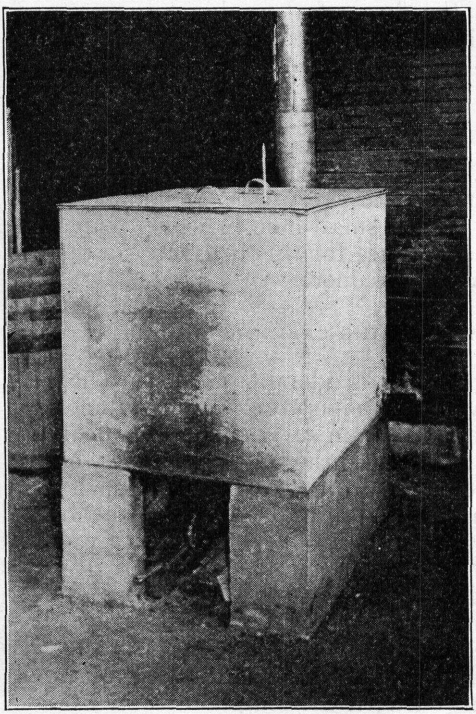

FIGURE 3.—Galvanized-iron box for heating water and treating utensils in small retail and medium-sized wholesale dairies. A steam boiler is not required

The utensils are placed in this container on a slatted rack 1 or 2 inches off the bottom to keep them above the water. The lid is then put on and enough heat applied underneath the box to boil the water. The steam generated soon raises the temperature in the box to about that of boiling water. A thermometer should be inserted in the lid in order to show when this temperature is reached. This temperature should be maintained at least five minutes. The process is exactly the same as for any other steaming cabinet, except that the steam is generated within the box.

In experiments made by the bureau, the bacteria contained in 10-gallon cans after they had been washed and rinsed were practically all killed by steaming the cans in the box shown in Figure 3. Each of these cans contained, on the average, at least 80,000,000 bacteria before being treated, as compared with 2,100 after the treating.

This box may also be used to heat the water for washing the utensils. If steaming immediately follows washing, only a comparatively small quantity of fuel is needed for steaming if most of the water has been drawn off for washing. Enough water should be left so that the box will not be dry upon completion of the steaming process.

Blue prints of this box and instructions for operating it, and also blue prints of steaming cabinets for use with steam boilers, may be

obtained free from the Bureau of Dairy Industry, United States Department of Agriculture, Washington, D. C.

USE OF A STEAM JET

Utensils such as cans and pails may be treated to kill bacteria by inverting them over a steam jet, but this system is not recommended because there is no way of knowing the temperatures reached and thus making sure that the heat applied has been sufficient to kill bacteria. More care must be taken in drying the utensils, and there is more temptation for the operator to slight his work, than in the case of the other three methods described.

The effectiveness of the jet depends upon the steam pressure used (as shown by the steam gauge), the size of the opening through which the steam is ejected, and the length of time the utensils are steamed. It usually requires about half a minute to steam a 10-gallon can thoroughly if the steam pressure is 20 to 25 pounds. If a steam jet is used, the utensils should be steamed until they are too hot to handle with the bare hands. After treatment in this manner they will become dry from their own heat if placed right side up and left uncovered for a few minutes before they are inverted on the rack.

Steam jets may be made easily by extending a pipe from the boiler half an inch or an inch up through the drain board of the sink and providing a valve in the pipe directly beneath the drain board by which the steam may be turned on and off.

KILLING BACTERIA ON LARGE EQUIPMENT

Utensils and equipment, such as coolers and bottle fillers, which it may not be practicable to put into the cabinet, may be treated by covering tightly and turning in steam or boiling water. If running water is available, it may be heated with steam by means of a mixing tee and run over the cooler or into the bottler and other equipment, at about boiling temperature. The boiling water comes in direct contact with the surface of the utensils, kills bacteria, and also rinses the utensils. This method is preferable to that of attempting to free utensils from bacteria by shooting steam at them through a hose. Steam applied through a hose has lost much of its heat by the time it reaches the bacteria and so serves only as a meager rinse. When water is used, care should be taken that it is boiling hot and that enough is used to heat the utensils thoroughly. A satisfactory way to treat bottlers is to fill them full of boiling water and allow them to stand five minutes or longer. Milking-machine rubbers and teat cups also may be treated with hot water, although slightly different treatment is required than for other utensils. Directions for cleaning milking machines are given in Farmers' Bulletin 1315, Cleaning Milking Machines, a copy of which may be obtained free by writing the Office of Information, Department of Agriculture, Washington, D. C., as long as there is a supply available for free distribution.

CHEMICAL TREATMENT OF UTENSILS

Another method of treating utensils to kill bacteria is by the use of chemicals. A number of chemical compounds will kill bacteria, but

not all of them are suitable for use with dairy utensils. The chemicals commonly used for treating dairy utensils are sodium hypochlorite, calcium hypochlorite, and compounds containing chloramines. Before using this method it should be ascertained whether the board of health recognizes and permits its use.

MAKING CALCIUM HYPOCHLORITE SOLUTIONS

In using calcium hypochlorite, prepare a stock solution by making a smooth watery paste of 12 ounces of commercial chloride of lime containing 30 per cent available chlorine (or 15 ounces of chloride of lime containing 24 per cent available chlorine), and then adding water slowly and stirring thoroughly until the solution amounts to 2 gallons. Let this settle and then strain into a tightly closed glass bottle or jar and keep it in a cool, dark room. Add 1 pint of this stock solution to every 8 gallons of water for the final rinse. Use this immediately. The used rinse solution should be thrown away and a fresh rinse dilution made up just before the next treatment of the utensils. It is advisable not to make larger quantities of stock solution than can be used within two weeks time.

MAKING SODIUM HYPOCHLORITE SOLUTIONS

Make a smooth watery paste of 12 ounces of commercial chloride of lime containing 30 per cent available chlorine (or 15 ounces of chloride of lime containing 24 per cent available chlorine), then add water slowly and stir thoroughly until the solution amounts to 1 gallon.

Dissolve 27 ounces of washing soda (use the common crystals, not powder or cooking soda) in 1 gallon of warm water. If chloride of lime containing 24 per cent available chlorine is used, it will require 34 ounces of washing soda.

Mix these two solutions, stir thoroughly, and let stand for several hours. Strain or siphon off the clear liquid into a tightly closed glass bottle or jar and keep it in a cool, dark room.

One pint of this stock solution should be added to every 8 gallons of water for the final rinse.

These rinse solutions contain about 200 parts of available chlorine to 1,000,000 parts of water, which is the strength recommended for farm use.

Chlorine compounds in various forms and under numerous trade names are on the market. They usually cost more than the home-made solution, but some labor is saved in that a stock solution need not be prepared and they are usually more uniform in strength.

Farm dairy utensils may be treated with chlorine solutions in two ways: By immersing, and by spraying. By immersing the utensils in a tank containing the chlorine solution the entire surface comes in contact with the chemical. Each utensil should be completely immersed and left for at least two minutes. The spray method may be used for large utensils and is especially suitable for treating coolers in which both water and brine flow. The sprayer used should be of the pressure type, capable of covering considerable area with a fine spray.

It is essential that every particle of organic matter be removed before treatment with chlorine compounds, as milk, cream, or other organic matter weakens the effect of the chlorine solution on bacteria. The solution should be applied immediately after completion of the washing process. Turn the utensils upside down in a clean, dry place free from odors and all sources of contamination, and do not touch until needed.

5

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